

REMARKS

This amendment is responsive to the Office Action of October 31, 2007. Claim 1 has been cancelled, and claims 2-6 have been amended herein. Claims 7-21 have been added as new claims. Reconsideration and allowance of claims 2-21 are requested.

The Office Action

Claims 1-6 were rejected under 35 U.S.C. §103(a) as unpatentable over Atalar *et al.* (U.S. 5,699,801) in view of Hastings *et al.* (U.S. Pub. No. 2002/0103430) and further in view of Moore *et al.* (U.S. Pub. No. 2002/0007120).

The Present Application

The present application is directed to a system that inhibits resonance within a catheter and/or cable up to a given magnetic resonance frequency. To this end, the cable is constructed in a manner to achieve a low shortening factor.

The present application discloses conductors 4 of a positioning antenna 4,5 running along a catheter 1. When leads run along a catheter, the excitation RF field is typically received by the leads causing heating of the surrounding portion of the patient. The present application operates these leads at a positioning frequency. To inhibit heating, first the shortening factor is chosen such that the common mode or positioning frequency is shifted from the imaging resonance frequency. Second, the leads are minimized in diameter to a minimum which is still sufficient to carry D.C. power to components at the catheter tip and carry imaging data and other information from a receiving coil 12 and other electronics in the tip.

The References of Record

Atalar *et al.* provides a method for magnetic resonance imaging and spectroscopic analysis of the interior of a specimen. Radio Frequency (R.F.) pulses are provided to a region of interest to excite magnetic resonance signals.

Atalar *et al.* only discloses that the distance between electrodes is between 0.1 mm and 30 mm.

Hastings et al. illustrates a method of magnetically manipulating a medical device within a human patient.

Moore et al. illustrates an elongated catheter body with a rotor situated at the distal end.

**The Claims Distinguish Patentably
Over the References of Record**

Independent **claim 7** recites *the distance between the two electrical conductors being approximately 50 μm* . The cited references, alone or in combination, fail to disclose or suggest such a feature. Furthermore, the claimed subject matter is not rendered obvious by the combination of the cited references.

Atalar et al. relates to a method for positioning a specimen within a main magnetic field, introducing an invasive probe that has an elongated receiver coil into the specimen, and then extracting information from the specimen by reading magnetic pulses. However, **Atalar et al.** fails to disclose or suggest *the distance between the two electrical conductors being approximately 50 μm* , as claimed.

Atalar et al. appears to disclose that the electrical conductors can be spaced from 100 μm to 30 mm. However, a person having ordinary skill in the art and ordinary creativity would not move the wires of **Atalar et al.** closer than the distance disclosed. Reducing the wire distance to 50 μm would change the frequency of the **Atalar et al.** coil such that it would no longer be tuned to the resonance frequency

Atalar et al. no provides indication that changing the frequency would increase performance. Furthermore, the cited reference is silent with respect to any shifting of the lowest possible resonance frequency of the cable outside of the magnetic resonance frequency. Such a move of the coil resonance frequency would detune it, rendering it unsuitable for its intended purpose. The fact that **Atalar et al.** discloses a broad range of up to 30 mm means that in the final analysis, the cited reference would not lead a person of ordinary creativity to create a small shortening factor by reducing the wire spacing of the cited reference by an additional fifty percent.

Furthermore, mere experimentation would not lead a person of ordinary skill and creativity to move the wires closer than the distance disclosed in the cited

reference, since moving wires closer together can introduce engineering difficulties. For example, as wires are moved closer, less dielectric exists between the wires. This can alter capacitive coupling between the wires, thereby reducing performance. Claim 7 involves a significantly closer position of wires for reasons not mentioned in the cited reference. Thus, the cited reference fails to disclose or suggest *the distance between the two electrical conductors being approximately 50 μm* , as recited by claim 7.

Additionally, the combination of Hastings *et al.* and Moore *et al.* fail to make up for the aforementioned deficiencies of Atalar *et al.* Hastings *et al.* relates to a method of magnetically manipulating a medical device within a human patient. The magnetic moment of a pickup coil at the tip is changed, resulting in a change of position. Moore *et al.* appears to disclose an elongated catheter body with a rotor situated at the distal end. Power is applied to the stator windings 58, causing the rotor 22 to rotate. Power is transferred between the stator and rotor winding 5 power a distal element 16. It is submitted that Moore is not analogous prior art.

Hastings *et al.* and Moore *et al.* fail to disclose or suggest reduction of shortening factors, or *the distance between the two electrical conductors being approximately 50 μm* , as recited by claim 7. Thus, the cited references, alone or in combination, fail to disclose or suggest the claimed aspect of claim 7.

In view of the foregoing, it is readily apparent that the cited references do not render claim 7 obvious. Therefore, it is respectfully requested that this rejection be withdrawn with respect to independent **claim 7** and dependent **claims 2-6 and 8-13**.

Claim 14 calls for (1) an RF coil array for exciting resonance, and (2) a position sensor coil array. Moreover, claim 14 calls for the catheter to have an image acquisition coil and a localization system. Such a combination is not disclosed or suggested by the references of record. **Dependent claims 15-20** focus on details of its combination and distinguish yet more favorably over the references of record.

Claim 21 addresses configuring the conductors to have a common mode frequency shifted beyond a frequency of the MR signals. None of the reference of record address this concept. Accordingly, it is submitted that **claim 21** distinguishes patentably over the references of record.

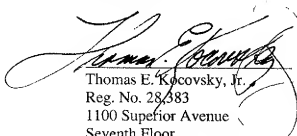
CONCLUSION

For the reasons set forth above, it is submitted that claims 2-21 (all claims) distinguish patentably over the references of record and meet all statutory requirements. An early allowance of all claims is requested.

In the event the Examiner considers personal contact advantageous to the disposition of this case(s), he is requested to telephone Thomas E. Kocovsky, Jr. at (216) 861-5582.

Respectfully submitted,

Fay Sharpe LLP

A handwritten signature in dark ink, appearing to read "Thomas E. Kocovsky, Jr.", is written over a horizontal line. The signature is stylized with a large, sweeping initial "T".

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